

## **Comments on NPRM, ET Docket 04-37**

### **Concerning proposed amendments to Part 15 rules regarding Access BPL systems.**

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I am an Extra class amateur radio licensee, callsign AI4CB, and licensed since December 2002. I hold a B.S. and Ph.D. in Physics, and have a 20 year career as a research scientist at a major national laboratory.

As a licensed user of the HF radiofrequency spectrum that will be negatively impacted by the widespread implementation of BPL systems, I am of course very concerned about the potential for harmful interference by these systems to my amateur radio operations. I am concerned about the steps that will be necessary to report and promptly mitigate such interference should it occur.

The comprehensive and detailed technical analysis within the recently released NTIA study [*NTIA Report 04-413, Potential Interference from Broadband Over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7-80 MHz. Phase 1 Study.*] has proven beyond any reasonable doubt that the Part 15.209 limits on emissions that are proposed to apply to BPL will provide very little or no real protection against interference. The study shows, among other things, that there is high likelihood of high levels of interference to HF reception at distances up to hundreds of meters from BPL systems operated at Part 15 limits. For a specific example, at 15 MHz, which is near the 20 meter amateur radio band, the NTIA finds that high levels of interference, essentially a factor of ten degradation of signal-to-noise ratio, would be experienced by 90% of fixed receivers located within 100 meters of a BPL device and its associated power line operated at the Part 15 limits. For reference, my typical residential neighborhood has power lines within 30 meters of almost all of the homes, and of course on two sides of homes at street corners, and additional power lines on neighboring streets generally within 100 to 200 meters in all directions.

Furthermore, the NTIA study confirms that the field strengths from BPL emissions do not always decrease monotonically with distance, but in fact peak at various heights and distances so that the customary measurement and extrapolation methods will be inaccurate. In addition, the fall off of field strengths with distance from power lines is much less rapid than traditional localized devices, varying roughly as the inverse of distance rather than the inverse square of distance. These findings all have direct bearing on the validity of the assumptions behind the proposed rules and measurement guidelines in 04-37.

The NTIA report focuses upon federal government frequency allocations, but as these frequencies are interspersed throughout the HF spectrum, and in many cases adjacent to amateur radio frequency bands, the results and concerns apply equally well to amateur radio frequency allocations. Incidentally, the NTIA findings support, confirm and extend previous technical comments filed last year by the American Radio Relay League on the Notice of Inquiry, Docket 03-104. .

Since the NTIA study, as well as the earlier ARRL filings on this issue, all consistently show that Part 15 limits provide no practical protection, BPL providers must be required to make every possible effort to employ good engineering practice to reduce radiated emissions to well below the Part 15 limits. The NTIA report for example proposes that the minimal power necessary be

used, that great care be exercised in minimizing common mode currents and impedance mismatches. Since power lines are not shielded and contain nonlinearities and unbalances, basic physics dictates that it is impossible to totally eliminate residual signal emissions, harmonics and common mode currents from them, but these effects can be reduced significantly with good engineering practice.

However, the NPRM does not specifically address these technical issues or impose requirements to minimize BPL emissions. Hopefully, the FCC will take the NTIA recommendations into consideration and either upgrade the NPRM accordingly, or issue a follow-up NPRM.

Thus the only *operative* recourse under the current or proposed rules for amateur radio operators experiencing interference will be the prohibition against *harmful interference*. The definition of *harmful interference* is not linked to any particular emission level, so that in principle it is prohibited regardless of what the actual emissions levels are.

Proposed rule 15.109(f) reinforces the prohibition against *harmful interference* and broadly outlines a requirement for BPL providers to provide for interference mitigation in their systems designs and installations. This seems reasonable, as far as it goes. However, the rule fails to provide a standard for what constitutes *harmful interference* in this context.

Most amateurs, quite justifiably, will insist that any interference at all, even any perceptible increase in the noise floor, will be harmful to their communications. On the other hand, access BPL providers would certainly reject such a definition. Perusal of amateur comments filed to date on the Docket 04-37 indicate widespread, heart-felt skepticism within the amateur community that BPL providers will voluntarily, in good faith, adequately manage interference to amateurs. Comments filed on last year's Notice of Inquiry by BPL providers, and the recent alarming refusal by the BPL provider in North Carolina to mitigate demonstrable interference, tend to confirm the amateur's fears that the BPL providers do not intend to take interference seriously. I believe that such severe polarization on this issue already has occurred, that voluntary compromise on the interference issue without additional FCC guidance is probably impossible at this point.

Presumably, then, in actual practice, harmful interference in the context of proposed rule 15.109(f) will probably mean an official finding by the FCC enforcement bureau, pursuant to complaints filed by amateurs.

The underlying problem is that the current regulatory definition of *harmful interference* as stated in the FCC regulations Part 15.3 and elsewhere, is subjective and vague. Without objective standards, the BPL providers do not have design criteria to work towards, so have little motivation to minimize their emissions. Without standards, the enforcement bureau will likely receive blizzards of complaints from amateurs, some of which will likely be frivolous.

Thus the efficacy of the proposed interference mitigation under the current NPRM language would depend entirely upon determinations by the Enforcement Bureau of what constitutes *harmful interference*. And the present NPRM is incomplete in that it does not address this issue.

To avoid such a future enforcement quagmire if BPL is to become widespread, it is essential that the FCC promptly follow up, as soon as possible, with a new regulatory definition of *harmful interference* in this context and attempt to set standards. The standard should be objective, easy to understand and easy to measure and verify using equipment commonly

available to amateurs. A direct way to do this is in fact already suggested by the NTIA report. The NTIA studies used definitions of interference that are related to the degradation of signal-to-noise ratio due to BPL signals. Likewise, the FCC could develop an objective definition of *harmful interference* based upon the actual effect on received signal-to-noise ratios. Actual received interference then could be recorded by the amateur using various audio or electronic methods, for purposes of documenting interference and reporting the quantitative effect to the BPL providers. Interference can be easily verified by mobile monitoring with commercial HF receiving equipment by FCC field agents when necessary. Additionally, access BPL providers themselves would have the ability to voluntarily self-monitor their own compliance with the *harmful interference* regulation, and make adjustments to their operations accordingly without waiting for amateur complaints or government intervention.

A more objective standard for what constitutes *harmful interference* to received signals will give all parties involved a common point of reference and a common goal. This will minimize the need for FCC intervention in the long term. The FCC may wish to establish and fund a working group composed of technical representatives from key amateur radio organizations and BPL providers, with leadership provided by FCC and NTIA engineers, to see if such a common quantitative measure of *harmful interference* can be devised.

I appreciate the opportunity to comment on the proposed rules. There were many more issues and aspects of the proposal that I feel deserve comment, but most of these I expect will be adequately addressed by the ARRL in their filing, or have been already highlighted by other amateur commenters.